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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/675,140	09/30/2003	Anish Gocl	0492611-0482	5719
24280	7590	10/11/2007	EXAMINER	
CHOATE, HALL & STEWART LLP TWO INTERNATIONAL PLACE BOSTON, MA 02110			MCCRACKEN, DANIEL	
		ART UNIT	PAPER NUMBER	
		1793		
		MAIL DATE	DELIVERY MODE	
		10/11/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/675,140	GOEL ET AL.
	Examiner	Art Unit
	Daniel C. McCracken	1754

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 11 July 2007.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-40 is/are pending in the application.
 - 4a) Of the above claim(s) 1-9 and 14-40 is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 10-13 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) 1-40 are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| <ol style="list-style-type: none"> 1)<input checked="" type="checkbox"/> Notice of References Cited (PTO-892) 2)<input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) 3)<input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | <ol style="list-style-type: none"> 4)<input checked="" type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ 5)<input type="checkbox"/> Notice of Informal Patent Application 6)<input type="checkbox"/> Other: _____ |
|---|---|

DETAILED ACTION

Citation to the Specification will be in the following format (S. # : ¶) where # denotes the page number and ¶ denotes the paragraph number. Citation to patent literature will be in the form (Inventor # : LL) where # is the column number and LL is the line number. Citation to the pre-grant publication literature will be in the following format (Inventor # : ¶) where # denotes the page number and ¶ denotes the paragraph number.

Election/Restrictions

Newly submitted claims 1-9 and 14-40 are directed to an invention that is independent or distinct from the invention originally claimed for the reasons set forth in the Requirement for election /restriction mailed 10/14/2005.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 1-9 and 14-40 withdrawn from consideration as being directed to a non-elected invention. See 37 CFR 1.142(b) and MPEP § 821.03.

Alternatively, the Examiner is interpreting Applicants' claims as filed 7/11/2007 to have the incorrect status identifiers, and has overlooked this omission. The result is the same: Only Claims 10-13 were examined.

Information Disclosure Statement

In the 37 C.F.R. 1.132 Affidavit filed 7/11/2007, Applicants draw the Examiners attention to an Goel, et al., *Size analysis of single fullerene molecules by electron microscopy*, Carbon 42 (2004) 1907-1915 (hereinafter “Goel at __”). While this is a post-filing date reference, the Examiner makes note of the following passage:

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In this functionalized fullerene, the carbon atom of the functional group is bridged to two carbon atoms of the fullerene molecule. It was expected, *based on known behavior of the similar bromomethano[60]fullerene [18], that the two chlorine atoms could be substituted readily to provide a chemical tether to a compound of interest.*

(Goel at 1909, col. 1). Footnote 18 in Goel recites: “[18] Meier MS. Department of Chemistry, University of Kentucky, Personal communication, 2001.” The Examiner considers such information material to patentability and requests that Applicants provide the personal communication – if memorialized in writing – on an IDS. If it is not memorialized in writing, the Examiner requests that Applicants submit an appropriate affidavit addressing what was known about said functionalized fullerenes, whether it had been described in any patents or printed publications, if it had been used or on sale in this or another country, etc. so that the Examiner may properly ascertain whether a rejection under 35 USC §§102-103 may be appropriate.

Drawings

The Examiner makes record of page 20 being absent from the application, yet no corresponding figure in the drawings is missing.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 10-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 recites a “[f]ullerene structure chemically bonded to a surface of a bulk carbon material.” All the claim requires is a “chemical bond.” This term was subject to some dispute in the interview of 6/20/2007. Indeed, a physical bond could be interpreted as one type of chemical bond. Another reasonable interpretation might be a “covalent bond” or “sharing of electrons between two atoms.” If the latter is indeed the case (see written description rejection *infra*), then the “fullerene” structure is not in fact bonded to a surface, but rather bonded to an atom. This issue was raised in the interview by the Examiner, and can be summarized as such: It is axiomatic that a surface is defined by three points. All that is required of a “chemical bond” is the sharing of electrons between *two* atoms, i.e. a “connection” at *one* point. To say that the fullerene structure is chemically bonded to a surface is indefinite, as theoretically, one bond could exist between some “bulk carbon material” and a fullerene. It is chemically bonded, but is it bonded to a surface, or a point (atom)?

It is Office policy to give claims their broadest reasonable interpretation. MPEP 2111. Claim 10 (which is effectively carbon bonded to carbon) is a broad claim to begin with. Applicants amendment to recite a “bulk carbon material” was presumably made to differentiate the instant claims from functionalized fullerenes (e.g. C₆₀ bonded to some alkyl group, which the claims could arguably read on). In light of the discussion above however, there are still issues in the claim language (i.e. the bond/surface issue) that make this rejection appropriate. The Examiner is making one of these rejections, but Applicants should be apprised that he could make *many, many* more. Further, fullerenes bonded to other allotropes of carbon (e.g. diamond or nanotubes/other fullerenes) would read on at least Claim 10.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 10-13 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The methodology adopted by the Office for determining the adequacy of the written description is set forth in MPEP 2163, *et seq.* The Examiner recognizes and appreciates the strong presumption that an adequate written description of the claimed invention is present when the application is filed. *See In re Werthheim*, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976). Further, the Examiner recognizes and appreciates the burden is on the Office to present evidence or reasons why one skilled in the art would not recognize that the written description provides support for the claims. As such, the Examiner makes the following findings of fact in accordance with the Office methodology as set forth at MPEP 2163 II. (“Methodology for Determining Adequacy of Written Description”).

A. Read and Analyze the Specification for Compliance with 35 U.S.C. 112, para. 1

1. For Each Claim, Determine What the Claim as a Whole Covers

As noted in the rejection under 35 USC 112, second paragraph the Claims – certainly Claim 10 – is drafted quite broadly, requiring only a fullerene structure

(not limited to any particular species) chemically bonded to a bulk carbon material (not limited to any particular carbon material). Other claims limit the fullerene to C₆₀ and the bulk carbon material to carbon black.

2. Review the Entire Application to Understand How Applicant Provides Support for the Claimed Invention Including Each Element and/or Step

Claim Limitation	Support in Specification
Claim 10: "chemically bonded"	(S. 2: 1)
Claim 10: "to a surface of a bulk carbon material"	(S. 11: 5)*
Claim 11: "C ₆₀ "	(S. 3: 5 <i>et seq.</i>) ("Example 1")
Claim 12: "bonded to carbon black"	(S. 4: 1) ("tethered to carbon black")
Claim 13: "by a carbon atom bridged to two carbon atoms of the fullerene and two carbon atoms of a carbon black."	(S. 3: 5) ("Example 1")

* support alleged by Applicants in their Remarks of 7/11/2007.

3. Determine Whether There is Sufficient Written Description to Inform a Skilled Artisan That Applicant was in Possession of the Claimed Invention as a Whole at the Time the Application Was Filed

At the outset, the Examiner notes that the analysis/inquiry is focused on the *claimed* invention. It is, of course, the claims that define the invention. 35 U.S.C. 112, ¶2. The issue in this written description rejection is whether features in Applicants' claimed invention are in fact described in the specification in such a way to convey to one skilled in the art that Applicants possessed the claimed subject matter. Specifically, have Applicants demonstrated a "chemical bond?"

Of course, Applicants may demonstrate possession of the claimed subject matter in any number of ways such as an actual reduction to practice or sufficiently detailed drawing. While Applicants have "done something," as evidence by, for example, Figure

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2, the issue is whether Applicants have demonstrated what they have “done” is “what they have claimed.”

Where Applicants determine they have “chemically bonded” a fullerene to a carbon black particle is not entirely clear. Applicants state that electron microscopy was used to analyze the samples, which led to the observation of “fullerene-type” structures. (S. 4: 2). What the micrographs were analyzed for that led to the ultimate determination that “chemical bonding” was in fact occurring is unclear. Applicants provide a conclusory statement: “Qualitatively, the images show quite clearly that the carbon black doped with tethered fullerenes has many more fullerene-type structures than the pure carbon black particles.” (S. 5: 1). Stated differently, Applicants are stating that the sample they added fullerenes to shows more fullerenes than the sample they didn’t add fullerenes to (i.e. the control). *See* (S. 3: 5) (describing the experimental procedure). This fact in and of itself does not impress the Examiner.¹ The analysis – insofar as it was recited in the specification – was little more than counting fullerenes on a carbon black surface.

Turning to the micrographs provided by Applicants, the Examiner found this passage from the accompanying 1.132 declaration particularly relevant:

The fullerene structures reported by Donner et al. and the MIT group exhibit various shapes and sizes and different degrees or approaches to complete closure. Many of the structures are open or incompletely closed and for this reason they were referred to as shells in the first work reporting them (ref. 4 in the above Donnet paper). Whether any of these fulterene structures are stable fullerene molecules such as C₆₀ and C₇₀ is open to question. *Whether such fullerene molecules could even be seen in electron*

¹ Stated differently, say the Examiner has three bowls of green M&Ms®. One bowl of green M&Ms is set aside. To the other two, he adds red M&Ms. Reporting that the two bowls to which red M&Ms were added have more red M&Ms in them as proof that something happened between the red and the green M&Ms is not persuasive.

microscope images was questionable at the time of Donnet's work and at the time of the MIT work cited by Donnet. According to S. Iijima, the discoverer of single-walled carbon nanotubes and widely regarded the world's preeminent electron microscopist of fullereneic carbon materials, a small round object the size of a C₆₀ molecule he and Ajayan reported seeing in an electron microscope image could not be a C₆₀ molecule because C₆₀ would be too small to give a strong enough signal to form the observed image (Ajayan, P.M. and Iijima, S., *Nature*, 1992, 358, 23). Instead Iijima said the image must be that of a single-walled carbon nanotube viewed down its longitudinal axis. [Later work at MIT showed that C₆₀ fullerene can give an observable electron microscope image if the molecule is held in the electron beam of the microscope long enough to give sufficient signal for imaging. *Experience at MIT (Goel et al., Carbon, 2004, 42, 1907-1913) and elsewhere (Fuller, T. and Banhart, F., Chem. Phys. Lett., t 996, 254, 372-378) revealed that C₆₀ physically deposited (i.e., physically condensed or adsorbed) on a carbon surface moves or jumps out of the beam before sufficient signal could be captured.* In the MIT work, C₆₀ is held in place by chemically bonding it to the surface of a carbon black particle (Goel et al., *ibid.*)

(1.132 Declaration dated 7/11/2007, p. 4-5) (emphasis added). In the boldface italics type above, Applicants apparently cast doubt on whether the claimed structures could even be observed. If Donnet could not observe fullerenes, neither could Applicants. No difference is seen between the micrographs submitted by Applicants and any of the micrographs in any of the references applied below.

Applicants have attempted to draw distinctions between fullerenes and "fullereneic structures," Applicants having allegedly observed the former. *Id.* "Fullereneic structures" were exactly what Applicants were observing and using for the basis of their conclusion that they had "tethered" a fullerene to a carbon black particle. See (S. 4: 2) ("The images were analyzed for the presence of fullerene-type structures). Additionally,

THIS IS WHAT IS BEING CLAIMED. *See* Claim 10 ("Fullerenic structure chemically bonded to a surface of a bulk carbon material.") (emphasis added).

The Examiner is placing no weight on the Goel reference, as it has no relevance to the inquiry as a post-filing date reference. The fact that Applicants may have made additional observations or articulated them in a different fashion in an article published after the filing date of the instant application is immaterial. The prohibition against new matter bars their entry.

In summation with respect to the micrographs, "whats good for the goose is good for the gander." The Examiner is of the position that a chemical bond versus any other bond has not been clearly and conclusively shown – hence a written description rejection was made. If it has been shown, then any other micrograph showing fullerenic structures on a carbon black surface (like those in the art rejections *infra*) necessarily discloses "chemical bonding."

Response to Arguments, 1.132 Declaration & Remarks

The Examiner has read Applicants' remarks and accompanying 1.132 declaration and addresses each in turn:

A. Remarks

At page 4 of their remarks, Applicants state "[Professor Howard] explained that when the specification stated that fullerenes are difficult to detect and characterize because they are "often very strongly bound to, or within, the material with which they are condensed," it refers to a physical, rather than a chemical, bond." (Remarks of 7/11/2007, p. 4). Rewriting of the Specification will not be allowed. To the extent

Applicants wish to do so, this would be better addressed by refileing. Several reverences were addressed in Applicants remarks:

JP 11-140342 to Ueda

Applicants state “It was pointed out that the carbon materials disclosed in the laid-open Japanese publication number 11-140342 . . . did not constitute the chemical bonding of a fullerene to a carbon material but were merely fullerenes physically bound to carbon.” If it was pointed out in the interview, it was not pointed out in these Remarks. Attorney argument does not replace evidence where evidence is necessary. Ueda in fact comes closer to describing a “chemical bond” than Applicants. *Compare* (Ueda 6: [0019]) (describing an actual chemical reaction, including reagents used, etc.) *with* (S. 3: 5) (describing a process where fullerenes are mixed up with carbon black and dried). Further, Ueda describes confirmation “by mass spectrometry that fullerene C₆₀ was bound to the surface of the carbon black particles.” The Examiner is not placing much weight on whether, “bound” means “bound by sharing electrons,” or “bound by van der Waals forces,” because in reality, “bound” is whatever the Japanese machine translator churned out. Given the fact that Ueda describes a chemical reaction (Ueda 6, [0019]), the Examiner feels comfortable that this is a “chemical bond.”

US 6,358,105 to Schwob

Similarly, in their remarks, Applicants allege that “Schwob” doesn’t teach “what we did.” More than allegations are needed. The rationale articulated by this Examiner’s

predecessor in the non-final office action dated 11/29/2005 and summarily dismissed - sans discussion - by Applicants in their reply filed 6/8/2006 raises a good point: why wouldn't the plasma recited in Schwob have the energy necessary to break *one* double bond in the fullerene cage and share that electron with a carbon black particle? The Examiner is expecting this issue to be addressed in the next reply.

US 5,132,105 to Remo

Applicants make allegations that the structure in Remo would be unstable. (Remarks of 7/11/2007, p. 4). Again, more than allegations are necessary. If this was a thinly veiled attempt at attacking the enablement/operability of Remo, when a reference is found that anticipates the claims, it is presumed operable. Once such a reference is found, the burden is on applicant to provide facts rebutting the presumption of operability. *In re Sasse*, 629 F.2d 675, 207 USPQ 107 (CCPA 1980).

Remo in fact discloses, *in haec verba*:

The invention uses hydrogen to break one or more of the covalent bonds BO₂ of the C-60 molecule which ultimately allows a carbon bond to occur between carbon atoms on the surface of the carbon 60 and new tetrahedral structures growing out of the newly formed bond. This allows diamond crystals to form on the outside surface of the fullerene.

(Remo 3: 7) (i.e. it discloses a "fullerene structure chemically bonded to a surface of a bulk carbon material." Assuming *arguendo* that this structure was unstable as Applicants urge, this fact has no bearing on the anticipation inquiry. The structure was made. The structure was disclosed in the prior art.

Taylor, et al., *The chemistry of fullerenes*, Nature 1993; 363: 685-693

The interview revealed that Professor Howard and the Examiner could at least agree that a “C—C” bond was a “chemical bond.” Clearly, the polymerization recited in Taylor (Taylor at 687) discloses a “C—C” or “chemical” bond between a fullerene and another fullerene (i.e. a bulk carbon surface). Further, Applicants state in their own specification that “the method disclosed herein can be used to tether fullerenes *to the same or other fullerenes or fullerene derivatives.*” (S. 7: 4).

Donnet et al., *Fullerenic carbon in carbon black furnaces*, Carbon 2000; 38: 1885-1886

The Donnet reference was provided as a courtesy to Applicants. The Examiner had become aware of the Donnet reference after the final rejection of 1/12/2007, and made Applicants aware of the reference during the interview so they could ascertain whether continuing prosecution was in their interests. Addressing Applicants remarks and statements in their 1.132 declaration is not appropriate or “ripe,” as no rejection over Donnet has been made. See Claim Rejections 35 USC 102, *infra* for a discussion of Donnet.

Any allegations as to why the editorial board of the journal of Carbon would choose to publish any of Applicants’ work in reference to Donnet have *absolutely no bearing* on patentability. The peer-reviewers and editors at Carbon are not patent examiners. Similarly, the Examiner does not tell the journal of Carbon what to publish.

Conclusion - Remarks

To be clear, the Examiner offered no promises, statements, or opinions to the ultimate issue on patentability in the interview of 6/20/2007. The Examiner merely stated that without facts and amended claims in front of him, it was impossible to express any such opinion. As to Applicants' "assurances" to the Examiner that "claim 10 would not cover a material that did not include chemical bonding of a fullerene to the surface of a bulk carbon material," hopefully that is still the state of patent law - i.e. "a claim covers what it says." This issue moving forward is whether "what the claim says" is found in Applicants' specification and/or prior art, expressly or inherently.

B. 1.132 Declaration

The plain language of 37 C.F.R. 1.132 states:

When any claim of an application or a patent under reexamination is rejected or objected to, any evidence submitted to traverse the rejection or objection on a basis not otherwise provided for must be by way of an oath or declaration under this section.

As mentioned above, no rejection has been made over the Donnet reference, so any response is not yet ripe. See Claim Rejections 35 USC 102, *infra* for a discussion of Donnet. With respect to the remainder of Applicants' 1.132 declaration, the Examiner responds, as follows:

JP 11-140342 to Ueda

The Examiner notes Applicants reference to the Dresselhaus treatise, but Applicants emphasis here is misplaced and misapplied. The cited passages from the Dresselhaus treatise refer to solvent extraction and sublimation methods of separating

fullerenes from the soot by-product. Dresselhaus however does not mention - and Applicants do not address – the treatment that the fullerenes and carbon black receive in Ueda. *See* (Ueda 6: [0019]) (describing the reaction of carbon black with C₆₀ and KBr and/or KCN). Clearly something different has been done in Ueda than that done in the typical combustion/flame synthesis, arc discharge, or similar process. There is nothing to suggest that the fullerene bonded to the carbon black in Ueda would be separated by the techniques described in Dresselhaus, as Applicants urge.

US 6,358,105 to Schwob

Applicants statements with respect to Schwob are conjecture: “The Schwob recommendation of extraction for the purification, i.e., the removal of fullerenes from the carbon black, means that Schwob understands the fullerenes to be physically bound, not chemically bonded, to the carbon black.” (1.132 Declaration filed 7/11/2007, p. 3). What Schwob understands is not the issue. The issue is whether the fullerene is bonded to the carbon black. Given the plasma treatment recited in Schwob, it is expected that the energy would be sufficient enough to break at least one bond in the fullerene cage and bond with the carbon black.

US 5,132,105 to Remo

Applicants statements with respect to Remo are not persuasive. In accordance with the Office’s policy of giving claim limitations their broadest reasonable interpretation, the claims read of the reference. If “diamond” is not a “bulk carbon”

surface, Applicants are requested to point to that portion of the specification that defines “bulk carbon.” To the extent Applicants intend bulk carbon to be recognized as a term of art that does not include allotropes of carbon such as diamond, this should be presented in an appropriate affidavit with supporting documentary evidence. Applicants arguments directed towards process conditions in Remo have no legal relevance. *The pending claims are product claims.* “The patentability of a product does not depend on its method of production.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted). As mentioned in the response to remarks above, Remo discloses a fullerene bonded to carbon structures. (Remo 3: 1-7).

Taylor, et al., *The chemistry of fullerenes*, Nature 1993; 363: 685-693

The same arguments presented in response to Remo can be made with respect to Taylor. If another fullerene is not a “bulk carbon surface,” than what is? As noted above, this was contemplated by Applicants. (S. 7: 4).

Conclusion - Declaration

The Declaration does not have data or evidence - only speculation, as learned as it is. Section 8 (v) is not persuasive; the terminology the reference uses, or does not use, does not limit their product. Section 8(iv) does not clarify what a ‘physical bond’ is and how it differs from a chemical bond. A chemical bond is, very clearly, a physical bond.

To the extent any of the preceding discussion and/or analysis is necessary to support an art rejection below, the pertinent portions are expressly incorporated therein by reference.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The entire reference teaches each and every limitation of the rejected claims. The pinpoint citations provided are in no way to be construed as limitations of the teachings of the reference, but rather illustrative of particular instances where the teachings may be found.

Claims 11-12 are rejected under 35 U.S.C. 102(b) as being anticipated by US 5,132,105 to Remo.

With respect to Claims 10-11, Remo discloses a chemical bond “between carbon atoms on the surface of the carbon 60 and new tetrahedral structures growing out of the newly formed bond.” (Remo 3: 3-6).

Claims 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,358,375 to Schwob.

With respect to Claims 10-13, Schwob discloses carbon black with a high content of fullerenes. (Schwob 3: 32-38). Given the high temperatures recited in the reactor, it is expected

that the energy was sufficient enough to chemically bond the fullerenes to carbon black as claimed. *See e.g.* (Schwob 3: 39-42) (discussing temperature of the plasma). “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on prima facie obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by JP 11-140342 to Ueda.

With respect to claims 10, Ueda discloses “carbon black particles having fullerene bound to a surface thereof.” *See e.g.* (Ueda 1: [Means for Solving the Problems]; 3: [0009]). It is expected that Ueda discloses “chemical bonding” claimed due to the fact that a chemical reaction is recited. *See* (Ueda 5: [0016]; 6: [0019]). Further, Ueda recites “[i]t was confirmed by mass spectrometry that fullerene C₆₀ was bound to the surface of the carbon black particles.” (Ueda 6: [0018]). “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on prima facie obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re*

Fitzgerald, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-11 rejected under 35 U.S.C. 102(b) as being anticipated by Taylor, et al., *The chemistry of fullerenes*, Nature 1993; 363: 685-693 (hereinafter “Taylor at __”).

With respect to Claims 10-11, Taylor discloses fullerenes chemically bonded to other fullerenes (i.e. polymerization). (Taylor at 687) (“Box 1”). The examiner is interpreting another three dimensional carbonaceous molecule (i.e. C₆₀) to be the surface of a bulk carbon material. Arguments traversing this rejection should explicitly state (in affidavit form with accompanying documentary evidence) what a “bulk carbon material” is.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Donnet, et al., *Fullerenic carbon in carbon black furnaces*, Carbon 2000; 38: 1879-1902 (hereinafter “Donnet I at __”).

Fullerenes bound to carbon black particles are seen in Figs. 1-2. (Donnet I at 1886). It is expected that the bonding as claimed is taught, given to the similarity in the figures provide. Compare (Donnet I at 1886 “Figs. 1-2”) with (S. 17-25 “Figs 1-2, 4-6”). “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on prima facie obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ

594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Burden, et al., *In-situ Fullerene Formation – The Evidence Presented*, Carbon 1998; 36(7-8): 1167-1173 (hereinafter “Burden I at ____”).

Burden recites C₆₀ deposited on carbon black. (Burden I at 1169). As Burden recites “nucleation of fullerene molecules on the surface of previously untreated carbon black and graphite particles,” it is expected that the claimed bonding occurs. “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on *prima facie* obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Burden, et al., *In-situ Fullerene Formation – The Evidence Presented* [online] American Carbon Society [http://acs.omnibooksonline.com/papers/1997_ii376.pdf]²(hereinafter “Burden II at ____”).

Burden recites fullerene molecules nucleated on carbon black. (Burden II at 377 “Fig. 1”). Burden’s recitation of “fullerenes nucleat[ing] from conventional, intact graphene

² The American Carbon Society website lists a 1997 publication date, as seen on the url for the pdf file. As such, this reference is being treated as 102(b) art.

fragments” suggests chemical bonding in the manner claimed. “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on prima facie obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Berezkin, *Fullerenes as Nuclei of Carbon Black Particles*, Physics of the Solid State 2000; 42(3) 580-585 (hereinafter “Berezkin at ____”).

Berezkin discloses fullerenes serving as nuclei of large carbon black particles. The “fullerenes take on the properties of a physical surface, on which the carbon layer grows at the third stage.” (Berezkin at 583, col. 1). As such, it is expected that the bonding recited in the claims occurs. “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on prima facie obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-13 rejected under 35 U.S.C. 102(b) as being anticipated by Cataldo, *The impact of a fullerene-like concept in carbon black science*, Carbon 2002; 40: 157-162 (hereinafter “Cataldo at __”).

Cataldo recites the formation of fullerenes in carbon black. (Cataldo at 159, col. 2). They “appear on the surface of soot of carbon black.” *Id.* Further, Cataldo provides a discussion of the reactivity of the C₆₀ molecule. (Cataldo at 160). These reactive sites “play a key role in the interaction between the rubber and carbon black surfaces.” As such, it is expected that Cataldo discloses the bonds as claimed. “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on *prima facie* obviousness’ under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted].” The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-13 rejected under 35 U.S.C. 102(b) as being anticipated by Donnet, *Black and White Fillers and Tire Compound*, Rubber Chem. Tech. 1998; 71(3): 323-341 (hereinafter “Donnet II at __”).

Donnet discloses fullerenes observed on the particles of carbon black. (Donnet II at 337). It is expected that the bonding as claimed occurs. . “[T]he PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his [or her] claimed product. Whether the rejection is based on inherency’ under 35 U.S.C. 102, on

'prima facie obviousness' under 35 U.S.C. 103, jointly or alternatively, the burden of proof is the same...[footnote omitted]." The burden of proof is similar to that required with respect to product-by-process claims. *In re Fitzgerald*, 619 F.2d 67, 70, 205 USPQ 594, 596 (CCPA 1980) (quoting *In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433-34 (CCPA 1977)).

Claims 10-11 rejected under 35 U.S.C. 102(b) as being anticipated by US 5,648,523 to Chiang.

Chiang discloses C₆₀ chemically bonded to any number of alkyl, aryl, alkylaryl, etc. groups. (Chiang 1: 25 *et seq.*).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Art Unit: 1754

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

The entire reference teaches each and every limitation of the rejected claims. The pinpoint citations provided are in no way to be construed as limitations of the teachings of the reference, but rather illustrative of particular instances where the teachings may be found. As to the rejections under 35 U.S.C. §§ 102/103, where the applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the Examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection. See MPEP 2112 III. (discussing 102/103 rejections).

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over US 6,358,375 to Schwob.

The preceding discussion of Schwob accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over JP 11-140342 to Ueda..

The preceding discussion of Ueda accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Donnet, et al., *Fullerenic carbon in carbon black furnaces*, Carbon 2000; 38: 1879-1902 (Donnet I).

The preceding discussion of Donnet I accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Burden, et al., *In-situ Fullerene Formation – The Evidence Presented*, Carbon 1998; 36(7-8): 1167-1173 (Burden I).

The preceding discussion of Burden I accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Burden, et al., *In-situ Fullerene Formation – The Evidence Presented* [online] American Carbon Society [http://acs.omnibooksonline.com/papers/1997_ii376.pdf] (Burden II).

The preceding discussion of Burden II accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Berezkin, Fullerenes as Nuclei of Carbon Black Particles, Physics of the Solid State 2000; 42(3) 580-585 (Berezkin).

The preceding discussion of Berezkin accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Cataldo, *The impact of a fullerene-like concept in carbon black science*, Carbon 2002; 40: 157-162 (Cataldo).

The preceding discussion of Cataldo accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Claims 10-13 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Donnet, *Black and White Fillers and Tire Compound*, Rubber Chem. Tech. 1998; 71(3): 323-341 (Donnet II).

The preceding discussion of Donnet II accompanying the anticipation rejection is expressly incorporated herein. See above with respect to 102/103 rejections.

Conclusion

All amendments made in response to this Office Action must be accompanied by a pinpoint citation to the Specification (i.e. page and paragraph or line number) to indicate where Applicants are drawing their support..

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel C. McCracken whose telephone number is (571) 272-6537. The examiner can normally be reached on Monday through Friday, 9 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley S. Silverman can be reached on (571) 272-1358. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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